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Next, the connection of the organs of taste with the nerves is discussed and illustrated by pathological instances. All agree in making the glossopharyngeal the taste-nerve for the root of the tongue, but the opinions vary regarding the connections of the anterior two-thirds of the tongue.

Next, the effect of various drugs upon the taste organs was tried, with the result of showing that *alumen crudum* and *zincum sulphuricum* in solutions of 1.25-1.5 per cent had the most decided effect. Testing the same subjects as before, and denoting a slight weakening of the sensory effect by A, a stronger one by B, a very strong one by C, and a total absence of taste by O, we have the following result:

For *sweet*, the root is marked A twice, B eight times. The edge is marked B once, C three times, and O six times. The tip, C once, and O nine times. The soft palate and arcus glossopalatinus each, B once, C once, and O eight times.

For *salt*, the root is marked A three times, C seven times. The edge, A five times, B four times, and C once. The tip, C ten times. The soft palate, B five times and C five times. The arcus glossopalatinus, C ten times.

For *sour*, the root was marked A once, B once, and C eight times. The edge, A five times, B twice, and C three times. The tip, A once, B seven times, and C twice. The soft palate and arcus glossopalatinus each, B seven times, and C three times.

For *bitter*, the root was marked A ten times. The edge, A twice, B seven times, and C once. The tip, O ten times. The soft palate, A once, B twice, and C seven times. The arcus glossopalatinus, A twice, B eight times. In other words, the root of the tongue loses its perception of taste least under the action of drugs, the edges next, then the soft palate and arcus glossopalatinus, and most readily the tip. Again, the root retains best its taste for bitter, next for sweet, third for salt, and last for sour. The edge retains the other three tastes about equally well, but is most liable to lose all taste for sweet. The tip retains best what it tastes best, the sour, but loses absolutely what little taste for sweet and bitter it normally has, retaining a slight taste for salt.

Finally, the application of a 2 per cent solution of cocain, besides inducing anæsthesia, does away with all taste for as much as half an hour, and longer if the application is allowed to remain. The taste for salt and bitter seems to come back first, that for sweet last.

Action des acides sur le goût. JOSEPH CORIN. Archives de Biologie, VIII, fasc. 1.

The relation between chemical action and sensation of taste is at the simplest with acids. Substances that taste acid are chemically acid. The investigation of this relation is the object of this very commendable research. When the sense of smell is excluded by holding the nose or by using very weak solutions of acid, the following have almost exactly the same quality, though different intensities of taste, and were used for experiment, namely, chlorhydric, phosphoric, oxalic, formic, sulphuric, acetic, nitric, tartaric, citric, hypophosphorous, malic, and lactic. Precautions were observed in making comparisons, to operate always on the same part of the tongue (the tip), to use the same quantity of acid, and to allow the

same time for judgment. The tongue was used only when free of the effects of eating, drinking, or smoking, and was carefully rinsed. It was found best to test but a few substances per day, and these were of course varied in order, and arranged to avoid prejudgment. The number of taste organs stimulated, which Camerer found to affect the number of right guesses, does not seem to have been fixed beyond the using each time of the same quantity of the solution. In trying to fix the weakest solution of acids that could be distinguished from pure water, the experimenter found that with the same acid it varied at different times, probably with his own condition, from 3 to 35 parts in 10,000. It is possible, however, to compare weak solutions of the same or of different acids with a good deal of exactness if the experiments are made as nearly as may be at the same time. It was found that for solutions of chlorhydric acid ranging in strength from 15 to 25 parts in 10,000, a difference of 6 parts was distinctly perceptible; under exceptional circumstances, for solutions containing between 3 and 15 parts of acid in 10,000, a difference of 3 parts could be recognized. The portion of the research that bears directly on the connection of tastes with the chemical character of the acids, consisted in arranging variously proportioned standard solutions of the different acids in the order of their sourness. The results were consistent for both mono and polybasic acids, and are as follows: (1) the intensity of the acid taste is not the same for all the acids at the same degree of dilution, *i. e.* the same weight of acid diluted with the same weight of water; (2) the intensity of the taste is not proportional to the amount of replaceable hydrogen in the solution; (3) the taste of solutions containing each the same number of molecules of acid is stronger as the weight of the molecule is less. Whence it is concluded, (4) that "the intensity of the acid taste of a molecule of any acid depends on the relation of the weight of acid hydrogen contained in the molecule to the weight of the molecule." The order of the acids thus arranged is that given above. The experiments were all made by the author upon himself, and he recognized an educative process from the experiments in his power of discrimination. E. C. S.

Beobachtungen über die Geschmacksempfindungen nach der Zungenexstirpation. N. CYBULSKI and A. BECK. Transactions of the Academy of Sciences of Cracow, 1888; noted in Centralbl. f. Physiol. No. 12, Sept. 15, 1888.

These experimenters found in a patient whose whole tongue, including the basal taste papillae, had been removed, that there yet remained some ability to taste. The sensations of sweet, bitter and sour could be caused by touching the back of the throat or the mucous surface of the stump of the tongue with appropriate substances, though in the latter case they were only perceived when movements of swallowing were made. The taste of salt could not be excited.

Die Einwirkung der Kohlensäure auf die sensiblen Nerven der Haut. GOLDSCHIEDER. Verhandl. der Physiol. Gesells. zu Berlin, Nov. 25, 1887.

When the hand is plunged into a vessel of carbonic acid, a sensation of warmth is felt. This increases for a time and then declines.